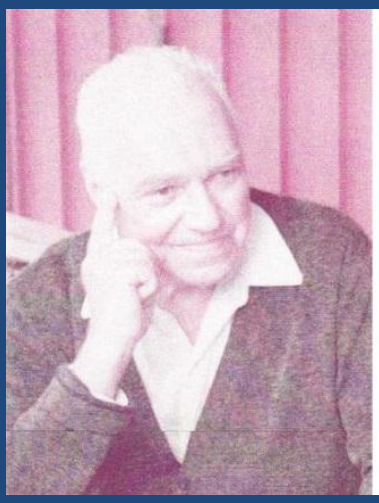

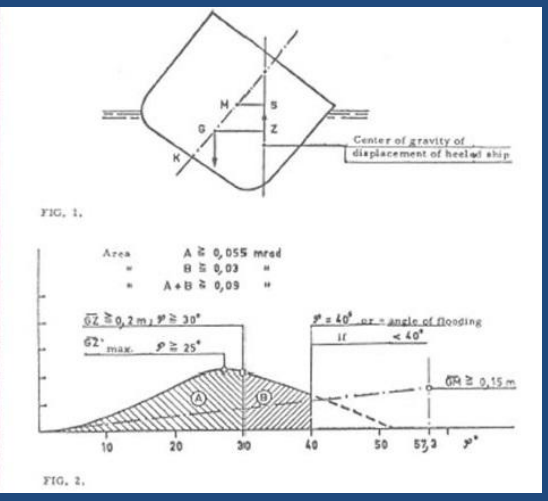

FIG. 1.

FIG. 2.

The Rahola Criterion

Jouni Arjava

The life and work of Professor Jaakko Rahola

Cover: A photograph of Jaakko Rahola and two figures related to the graphical presentation of The Rahola Criterion, as adopted from Appendix II, page 47, of the old Finnish (Translation) BOARD OF NAVIGATION REGULATIONS FOR STABILITY OF SHIPS, Issued on the 1st of August 1972. Published by Valtion painatuskeskus, Helsinki 1972. ISBN 951-46-0033-9

Jouni Arjava

The Rahola Criterion

The life and work of Professor Jaakko Rahola

Jaakko Rahola (1.6.1902 – 10.9.1973)

Editor: Risto Jalonen

Note:
This electronic publication is an abridged, electronic version of the biography “Raholan Kriteeri, Professori Jaakko Raholan elämä ja työ” by Jouni Arjava, published by Tekniikan viesti Rahola Oy in 2002. The English translation is kindly provided by Susan Sinisalo.

Editor of this electronic publication: Risto Jalonen

The estate of Jaakko Rahola and Jouni Arjava are thanked for the permissions to the use of the photographs.

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FOREWORD

On being approached by Professor Jaakko Rahola’s children with a request for me to write a biography of their father – a former teacher of mine and Rector of my alma mater – I realised that the task, though extremely agreeable, would also be a formidable one. For Rahola was not only a man highly respected within his field at home in Finland, but also a ship-building expert of international renown.

In my work, I have on many occasions turned to Jaakko Rahola’s children and other relatives for assistance, and they have afforded me a personal glimpse of the man behind the official public facade. Marja Almila and Jaakko Rahola Jr, whose company (*Tekniikan viestintä*) published the book, repeatedly found themselves having to answer my questions as my work proceeded. I have also received considerable assistance from former pupils and colleagues of the Professor, from the Helsinki University of Technology (now the Aalto University School of Engineering) and the government archives. To all of them I extend my heartfelt thanks.

Helsinki, March 2015
Jouni Arjava

CONTENTS

CHILDHOOD AND FAMILY

Jaakko Rahola was born in the small provincial town of Mänttä in rural Finland on June 1, 1902, the youngest of the 11 children of Johan Helenius, a storekeeper, and his wife Anna. Two of the children died in infancy, and the family lost their father only a couple of months before Jaakko was born. The eldest son, Jussi, took his father's place as head of the family, and as a child, Jaakko in fact believed Jussi was his father. Later, two of the brothers, Jussi and Arvo, assumed the responsibility for their siblings' welfare and education. They divided their charges between them, and Jaakko fell to Arvo. Their father had himself been the oldest of many siblings and acted as a "schoolmaster" to the younger ones.

At school, Jaakko Rahola eagerly joined in various activities, played in the orchestra and was ultimately chairman of the pupils' own society.

The Rahola family originally came from Ruovesi and Teisko in Western Finland, and the oldest known ancestor is mentioned as being a new settler of the Pirkkala wilds in 1589–1605. From there, several branches of the family spread further afield, settling along the shores of lakes Näsijärvi and Ruovesi. These extensive inland waterways had, ever since the times of the earliest settlers, been of great importance both as a means of transport and for their fish. Jaakko's grandfather, for example, took his wife and one of his sons with him when he set off to row from Teisko to Ruovesi, 50 km away, and back – just to pay a visit. It is therefore hardly surprising that members of the Rahola family later earned their living from ships and seafaring.

The attitude to life, worldview and convictions of Jaakko Rahola were to a great extent founded on the stable, pious legacy of his Western Finland ancestors.

STUDY

When Jaakko Rahola left school in 1920, his choice of career was not yet clear. His brother Eero, five years his senior, was a junior naval officer seconded to Italy for training. From there he wrote to Jaakko, "I now know what the right field is for you. You must train to be a ship-building engineer and a naval officer." The younger Jaakko heeded his brother's advice and enrolled immediately as an apprentice boiler smith at the Tampere engineering works that later became part of Tampella. His very first job was greasing a locomotive, and he spent his first wage of 300 marks on a steel-cased watch. In the autumn he began studying at the University of Technology.

Figure 1 Jaakko's school-leaving photo, 1920

Rahola spent the summers of 1922 and 1923 as a trainee in the ship-building department of an engineering firm (Kone- ja Sillanrakennus Oy). He made good progress in his studies and in

March 1925 was awarded a Master's degree with distinction in ship-building. He had written his degree thesis, "Designing a Gunboat", as a draftsman at a naval base. His work contributed to the development and preliminary design of the gunboats Väinämöinen and Ilmarinen built in the 1930s.

Despite making extremely fast progress in his studies and obtaining excellent grades, Jaakko Rahola never, according to his friends, appeared to be studying. He obviously took an active part in student life, for he held leading positions in his student union. He was a founding member of the Polytech Orchestra and sang in the Polytech Choir. He must have had phenomenal powers of concentration and an excellent study technique. In time, he would advise his children that if ever they looked up something in an encyclopaedia, they should at the same time read the preceding and subsequent entries, too. "This way, you accumulate knowledge!" He was in fact regarded as a walking encyclopaedia, and the pages of his own encyclopaedia were interspersed with sheets of flimsy paper on which he had written additions.

Jaakko Rahola was still writing his thesis when he began his compulsory military service, and in summer 1925, after graduating, he was ordered to direct the raising and investigation of an English torpedo destroyer that had sunk off the coast of the Karelian Isthmus (at that time still part of Finland). He was only a junior seaman at the time and was ordered to wear civilian clothes while on the job, because he would be issuing orders to officers. He was promoted to Corporal in the autumn. The training of naval reserve officers was still not yet fully established in those days, and its absence did not prevent him from taking three courses at the Military Academy and being promoted to Officer. In November 1925 he became a salaried ship-building engineer at the naval base.

The following year, Rahola had leave of absence and spent the whole autumn designing the s/s Suursaari to be built for the Board of Navigation at the Oy Lehtoniemi Ab works. It is interesting to note that the glowing reference he received at the end was signed by the company's Managing Director, an engineer by the name of W. Runeberg – son of Finland's "father of winter seafaring", Robert Runeberg and grandson of Finland's national poet Johan Ludvig Runeberg.

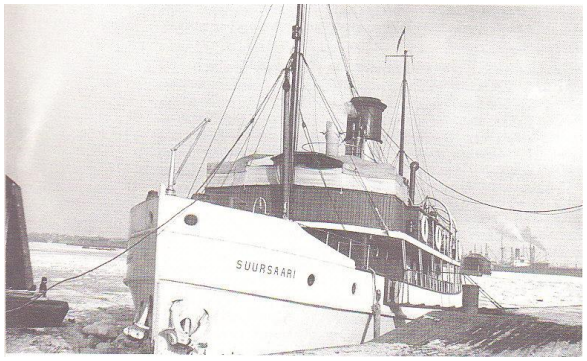

Figure 2 Rahola was one of the designers of *s/s Suursaari* at the Lehtoniemi shipyard in autumn 1926 (Photo courtesy: The Maritime Museum of Finland)

In late 1928 and early 1929, Rahola spent about four months studying at a shipyard in Genoa. From there he wrote to his wife at home in Finland:
"I'm quite frankly ashamed at the narrow scope and quality of the courses in ship-building theory at our 'University' now that I'm becoming aware of the corresponding courses in Italy, (and through books) Germany and France. If I had had the chance to listen to lectures like those

by Professor Seribanti, for example, I'd have saved a lot of time in these four months that I could have spent doing more independent theoretical work, for example…"

More than a decade was to pass before Rahola was himself in a position to rectify this.

At the Military Academy, Rahola completed the courses in naval warfare techniques and finally came top of his class in the naval defence course in 1929. He was promoted to Lieutenant commander in 1931 and appointed head of the Construction Office at Navy Headquarters in 1933. During those years, he spent a lot of time designing and supervising the construction of submarines and gunboats incorporating all kinds of technology new in Finland at the time. From 1929 to 1935 he was also in charge of the design and construction supervision of 16 VMV-class patrol boats ordered for the Coast Guard, likewise for the development of lifeboats and lifeboats cruisers for the Finnish Lifeboat Institution. He was also involved with the design of the first diesel electric ice-breaker, Sisu. By the end of the 1930s, he had either completely or partly designed a dozen or so vessels or types and had greatly contributed to others.

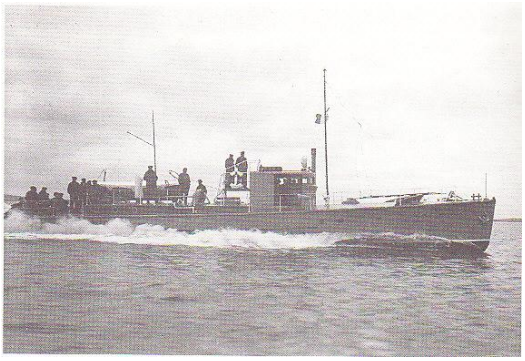

Figure 3 The gunboat *Ilmarinen*, viewed from the deck of the *Väinämöine*n, being fitted out. In the early 1930s the Crichton-Vulcan shipyard in Turku built four vessels with extremely advanced technology for the Navy: two coastal defence ships and two submarines. Rahola was involved with supervising their construction for several years, including underwater testing. (on left). (Original photo is from Wärtsilä Crichton-Vulcan Oy, copied in 1945 to the use of Jaakko Rahola in SOTEVA)

Figure 4 Testing the *VMV 12* on June 4, 1935, measured speed 23.732 knots. Rahola is the man on the right on the open bridge. (right, on the top) (Courtesy: Museum of Kymenlaakso, originally from the archive of Jaakko Rahola)

Figure 5 In the 1930s Jaakko Rahola designed both one- and two-propeller lifeboats built in Porvoo for the Finnish Life Boat Society. Seen here is the 2-propeller *Seiskari*. (right, on the bottom) (Courtesy: Archive of the Finnish Lifeboat Institution)

In 1936, Rahola had also devised a new method for rectifying the heel and trim of a leaking warship. The method was to replace the leak criterion requiring the somewhat time-consuming calculations that determined the heal and trim mechanically with a pair of compasses, thereby permitting rapid calculation of which watertight compartments needed to be filled to compensate for those that were leaking in order to place the ship on an even keel again. This was particularly important in big warships. Rahola intended this method for Finland's coastal defence ships and used it to test them.

Both Germany and Britain had got wind of Rahola's method and were keen to buy the rights to it. With the permission of the military commander on March 2, 1939, Rahola sold it to Britain. An officer promised to bring the payment for it to Finland, but he lost it and the money was never recovered.

No way could Jaakko Rahola be said to be vain, but the ceremonial dress of a naval officer at the time had epaulets with golden tassels. The fact that these were subjected to toy tax was a source of amusement for the family.

STUDIES OF STABILITY

Finland suffered some major shipping disasters in the 1920s, with the loss of many lives. The passenger steamer Kustavi operating in the SW Finland archipelago sank unexpectedly in Hanko Harbour in 1921 and some 30 people were drowned. The capsizing of the S2 torpedo boat formerly belonging to the Russian Navy in the Bothnian Sea in 1925, taking with it the entire crew of 53, involved Rahola in his official capacity, and the wreck of the passenger ship Kuru on Lake Näsijärvi in 1929 claimed the lives of 138, some of them his relatives. No wonder, therefore, that he became preoccupied with questions of stability.

At about this time, his expertise was also sought in the enquiries following certain other cases of capsizing.

Figure 6 At work on his doctoral dissertation.

When the ship-building Professorship fell vacant at the University of Technology in autumn 1937, Rahola had not yet obtained his Doctorate. His rival applicant, E.J. Helle, had obtained a Doctorate in engineering in Berlin and had been Acting Professor for several years. He had also been Rahola's teacher. In analysing why ships capsized, Rahola had accumulated material on a number of vessels and was planning to write his doctoral dissertation on this subject. In spring 1937, he tried unsuccessfully to obtain a grant and leave of absence in order to conduct research.

When the Professorship fell vacant in the autumn, he applied again and this time was successful. He requested time in which to qualify for the post, and both applicants were granted 18 months.

Methods of calculating the stability of ships, i.e. the lever or angle of heel, had been published in various countries from the mid-18th century onwards. The problem of stability had been addressed by such well-known scientists as Leonhard Euler and Daniel Bernoulli. Scientists had likewise come to realise that its stability affected not only the ship's angle of heel but also its roll. Methods had, from the late 19th century onwards, further been sought to determine the stability values sufficient for vessels of different kinds.

No widely-accepted criterion had, however, been arrived it. The method had to be such that the captain could be aware of his ship's safety whatever the cargo. He could, in storing his cargo, also affect the ship's centre of gravity and thus its stability. In the days of sailing ships, the experienced captain was immediately aware of his ship's stability when carrying different kinds of cargo the moment the wind got up, and he could trim his sails accordingly. Not so with a steamship. The captain might become aware of any instability only far out at sea, when the wind and waves arose, and there was no way he could compensate for them. The fact that a ship might also be too stable came as a new surprise. For this would cause violent rolling in a heavy sea and hence damage, in addition to being unpleasant. In a sailing ship, the sails effectively reduced the roll from side to side. This phenomenon, which applied only to steamships, was still new and strange to seafarers at the time. Since a ship with high initial stability reacted violently while one with low stability did not, the former might be described as unstable and the latter as stable. In extreme cases, this could lead to fatal misjudgements.

Doctoral dissertation

Jaakko Rahola's objective in writing his doctoral dissertation was to find a method of estimating the stability of ships with sufficient accuracy and for determining the minimum stability values, especially in Finnish waters.

While working on his dissertation, he spent over a month conducting research abroad. In Vienna he carried out pilot tests on the influence of bilge keels in Finland's minelayers; in several archives in Berlin he examined the factors leading to cases of capsizing, and in Hamburg he sought out material in archives and observed the operations of the relevant research institute. Finally he went on to London, where he worked in a library and collected details of capsizing disasters from both official and private sources.

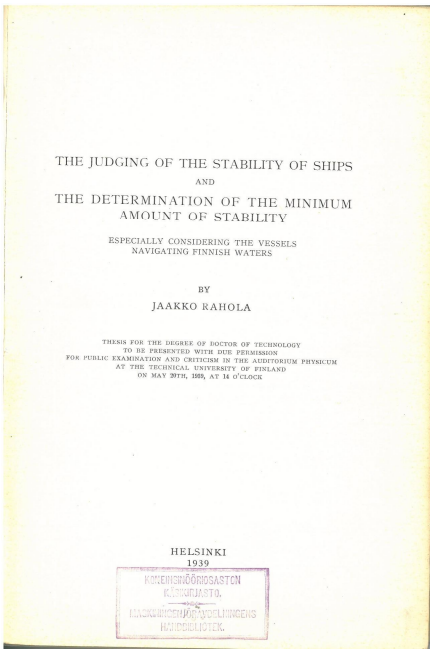
THE JUDGING OF THE STABILITY OF SHIPS
AND
THE DETERMINATION OF THE MINIMUM AMOUNT OF STABILITY
ESPECIALLY CONSIDERING THE VESSELS NAVIGATING FINNISH WATERS
BY
JAAKKO RAHOLA
THESIS FOR THE DEGREE OF DOCTOR OF TECHNOLOGY TO BE PRESENTED WITH DUE PERMISSION FOR PUBLIC EXAMINATION AND CRITICISM IN THE AUDITORIUM PHYSICUM AT THE TECHNICAL UNIVERSITY OF FINLAND ON MAY 20TH, 1939, AT 14 O'CLOCK
HELSINKI
1939

Figure 7 The cover of his doctoral dissertation.

The title of his doctoral dissertation, running to over 200 pages, is “The Judging of the Stability of Ships and the Determination of the Minimum Amount of Stability Especially Considering the Vessels Navigating Finnish Waters”. He makes a clearer distinction than previous researchers had done between “judging” and “determining” and says that his choice of topic was prompted by the successive disasters in Finnish waters. He classifies the waters navigated by Finnish ships as open sea, waters sheltered by the archipelago, and inland waters. Since stability theory did at that time not yet make sufficient allowance for swell, he examined ocean-going ships by means of statistics. He analysed the stability of ships that had capsized and compared the data with those of ships with a long accident-free history.

Jaakko Rahola’s doctoral dissertation became a global bestseller and soon sold out.

The practical finding of his doctoral dissertation: the minimum amount of stability sufficient for a ship expressed as curves. Upper curve: the static stability curve, i.e. the righting moment as a function of the angle of heel. Lower curve: the dynamic stability curve obtained by integration from the above. Note that the values for the lever of ships of different sizes are the same, as a result of which the values of the righting moment are in direct proportion to the weight of the displacement.

Rahola applied his theoretical perspective to ships in inland and coastal waters, where the swell is much smaller. He had heeling and yawing tests made using a heeling plotter of his own design.

As his assistant in his research Rahola had a draughtsman by the name of Tauno Kaartti from Naval Headquarters. Kaartti did the tests on ships and drew beautiful diagrams for the doctoral dissertation. A talented man, he quickly absorbed his superior’s theories and became a highly-respected shipbuilding designer far in excess of his formal training.

Stability criterion brings international fame

The doctoral dissertation came off the press in April 1939, and by October there was already an extremely glowing review of it in the prestigious Shipbuilder and Marine Engineer-builder journal. After the war, Rahola’s method for judging the stability of ships soon spread around the world and the edition quickly sold out. A separate edition was made in the Soviet Union for which, in according to local custom, no royalties were paid. The strength of the dissertation lies in the fact that although its argumentation is founded on a sound command of theory, the result is presented in such a way that a ship’s officer, for example, can apply it in practice. This method, known as “The Rahola Criterion”, was the first of its kind to be widely adopted internationally. Shipbuilding engineers the world over became familiar with the name of Rahola. He himself was surprised that his method remained in widespread use for so long, that it has been so frequently quoted by theoreticians and used in practical shipbuilding and seafaring right up to the present day. Subsequent advances on it do not conflict with it; they are mere supplements and further developments. The vast improvements in the knowledge and theory of weather and swell

conditions at sea have, in particular, meant that the theory for judging stability can now be applied even in extreme conditions.

While spending a couple of months in America, Jaakko Rahola wrote to his wife on July 26, 1951:

"…and then at the Coast Guard, which corresponds to our Board of Navigation and Coast Guard… I spent hours talking to a student of Anders Lindblad's (Mr. Jones Robertson) about the minimum stability of ships. I didn't learn much that was new, unless by new I mean that this country is, I notice, at the level we were at on these matters in 1937, when the Stability Committee issued its report here. I criticised this proposal a lot in my dissertation, so I think I may say that yesterday I was on the giving side. The gentlemen urged me to believe this when we parted. I think I've made a contact that will be lasting in certain respects..."

Examples abound of Jaakko Rahola's international acclaim. In 1955, the young Ilmari Kurki-Suonio, later to be Professor of Thermodynamics at Finland's University of Technology, was engaged in postgraduate studies at the illustrious MIT in Massachusetts. While there, he happened to get talking to Professor T. Troost, a leading expert on propellers. When the Professor heard where Kurki-Suonio came from, he immediately began talking in highly respectful tones about a Finnish stability expert with whom he had become acquainted.

In 1973, Jaakko Rahola's younger son Armas was in Dublin on business and there met a young Australian shipbuilding engineer. The Australian was amazed at how much Armas knew about shipbuilding, even though it was not his field. On hearing whose son Armas was, he almost "jumped for joy" at meeting a close relative of such a great and famous ship theorist. To his chagrin, Armas did not have a chance to tell his father about this as his father died shortly after.

When the stability regulations were being honed by the predecessor of the International Maritime Organization, formerly known as the Inter-Governmental Maritime Consultative Organization (IMCO), in 1966, the name of Rahola kept cropping up, and the German engineers, among others, had told the Finnish delegate they were amazed that Rahola had arrived at such a successful criterion with the material available to him at the time. With far more extensive data at their disposal, they had tried to come up with a better criterion, but they had always arrived at one the same as Rahola's. These IMO regulations, the wording – but not the content – of which was also influenced by a friend of Rahola's, Professor C.W. Prohaska from Denmark, are still in force.

To mark the 40th anniversary of the Rahola Criterion in 1979, the Australian branch of the prestigious British Royal Institution of Naval Architects published a 60-page article by R.J. Herd on the development of the stability criterion for ships. The name of the publication was "Rahola – 40 years on", and at the end, Herd sums up by saying:

“The world of ship design owes a great deal to the work of Jaakko Rahola. Much work had been done prior to Rahola but I feel that if he achieved nothing else, he drew together the threads of earlier work, examined various ways of setting up criteria and concluded that the study of sufficiency of stability based on causality analysis held out most promise of success.” An article published in the RINA yearbook for 1998, and especially the discussion it provoked, underlined the significance of the ground-breaking work done by Jaakko Rahola.

WAR

On receiving his Doctorate in May 1939, Rahola was head of the construction division at Naval Headquarters, but he had also applied for the Professorship at the University of Technology. For the minor subject required for a Doctorate he had chosen thermodynamics, with special reference to internal combustion engines (for these would, he predicted, become increasingly common in ships), but had postponed these studies until the following year. That year was, however, to take a very different course. In October, the Defence Forces called up its reserve forces for extra training, and Naval Headquarters undoubtedly came under similar pressure. Hence the NH staff almost certainly had no time for the study of subjects not connected with their work. The first bombs fell on Helsinki on the last day of November. The University of Technology was among the buildings hit. The nation found itself at war. Like many other things, the appointment of a new Professor was postponed and Jaakko Rahola continued in his former job.

The spring following the Winter War of 1939–1940 between Finland and the Soviet Union was a time for adjusting to the consequences of the war, but in the autumn, Rahola took the exam in his minor subject. The emphasis had, however, shifted away from the internal combustion engine and on December 17 he was officially recorded as having completed his Doctorate. Jaakko Rahola was appointed Professor of Shipbuilding on June 20, 1941, two days before the outbreak of the Continuation War (again between Finland and the Soviet Union). The previous December he had been made temporary head of the shipbuilding division at Naval Headquarters – temporary no doubt in anticipation of his foreseeable appointment as Professor but holding him in reserve should war break out again. Rahola was now doing two jobs simultaneously, but his teaching commitments at the University were less than normal due to the war.

The vessels built for the Finnish Navy during the war were the minelayers Riilahti and Ruotsinsalmi, the Porkkala and Pukkio ice-going coastal transporter vessels, Taisto-class motor torpedo boats, Kuha-class minesweepers, and vessels originally ordered as tugs by the Soviet Union. The division directed by Rahola also had the job of procuring military supplies from Italy; these included supervision of the building of Hurja-class motor torpedo boats, trial runs, and transport of the boats through war-ravaged Germany to Finland.

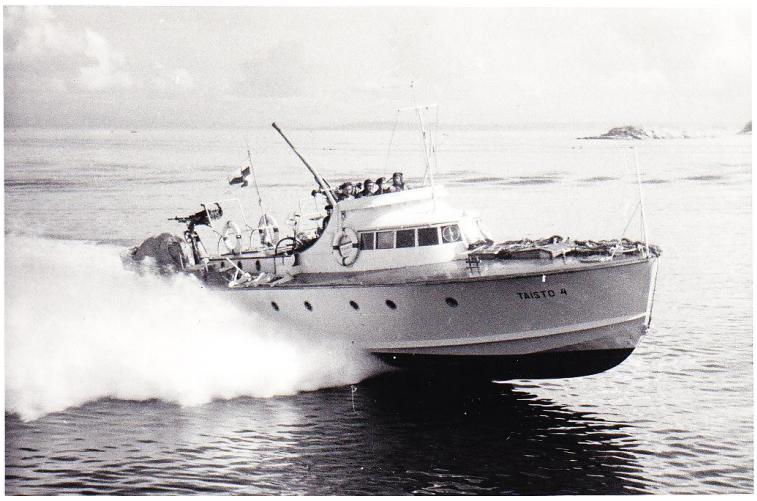

Figure 8 (on the left) The minesweeper *Ruotsinsalmi* designed by Jaakko Rahola. (Finnish defensive forces) and Figure 9 (on the right) *Taisto*-class motor torpedo boat. (Courtesy: Finnish defensive forces)

The turning point of the war in Italy

It was while he was in Italy that Rahola happened to witness one of the turning points in WWII. In September 1943, he was organising the transport of military supplies from Italy through Europe to Finland when Italy had just deposed Mussolini and signed a truce with the Allies. The Germans, whose fortunes had turned on the Eastern Front and in Africa, were still on Italian territory and preparing for battle there. Rome had been declared an "open city" in order to prevent its destruction, and everything was in chaos. In the Headquarters archives is a report dated October 6, 1943 of Rahola's experiences, written in shorthand, probably from his dictation. The following are excerpts from this:

"Commander Professor Rahola, who was in Rome in the days following the armistice and during the German occupation, has reported the following of the events during those days."

"Badoglio's government was expected to make peace without delay, but when this was not forthcoming, and Sicily was already lost, it was generally assumed in Rome that a completely new government would be set up in its place and seek a truce. Badoglio's government, and the King as well, were widely criticised for placing the country in a predicament while the war could not be avoided. No move was, however, made on behalf of Mussolini, and as a rule no one had anything good to say of him. Revelations about his private life were read with indifference, and the news later published that he had been released (by the Germans) did not arouse any enthusiasm. All in all, people in Rome did not in the least believe that Fascism could be revived in Italy."

"The attitude to the Germans seemed to be completely apathetic. Once the invasion had begun on the Calabrian peninsula, general talk of the advent of peace ended, … and not even all the high authorities, such as the cabinet head of the Admiralty, appeared to know that an armistice had in actual fact already been reached. Although Rome had been declared an open city, an

Italian military column of 7–800 vehicles had appeared in the city on around September 3 and taken up position in a park."

"The armistice was announced on the radio on September 8. Rumours were already abroad on that same day that the American Marines were on the move, and at around 3 pm, a German naval detachment in the city had received orders to pull out of Rome. The following night, the German Embassy was evacuated and… During the night, explosions and gunfire were heard from outside the city and seemed to be drawing closer."

"September 9: As of this morning, all the train and other routes out of Rome were severed… (They were reconnected on September 12.)"

The report goes on to describe various minor skirmishes between German and Italian soldiers. The Finnish Envoy, Minister Talas, began to seek accreditation for Rahola as Finland's assistant military attaché in order to get him diplomatic status. The Italians hoped the Germans would leave Italy voluntarily, promising them free passage. Crowds cheered and waved at a small Italian machine-gun detachment.

"Meanwhile, that day, I saw a fascist speaker in the Corso Umberto who did not seem to get any sympathy from the crowd. As he was speaking, some military persons arrived, arrested him and led him away."

That the Germans would depart was, however, wishful thinking. By September 10, the city and even the Vatican were already under artillery fire. Soon, a truce was again announced between the Germans and Italians, but then light gunfire was heard again. The Germans repossessed their embassy and gave it armed protection. Minister Talas arranged an audience for Rahola with the German commander in Rome, Major-General Stahel. The commander spoke fluent Finnish, having spent 6–7 years in Finland after the Finnish Civil War of 1918. Rahola's responsibility was to get the military supplies purchased from Italy through Germany to Finland, and Stahel was able to help. (This was, after all, in Germany's interests, too.)

Although the situation in Rome was for the most part peaceful, there were from time to time scuffles between the occupying forces and the Italians, and lives were lost on both sides. The Germans' aim was to disarm the Italians.

"…According to the report of one German NCO, a combat-ready Italian tank division had come face to face with some German troops south of Rome; the division had surrendered when the Germans fired a single anti-aircraft gun. … The Italian forces were, it no doubt seems, disarmed in such a way that the Italians abandoned their weapons out in the countryside and made off, each in their own direction. On the 13th, there were large numbers of unarmed Italian soldiers at the main station in Rome; they had probably spent the night at the station as well and were waiting to get home. On the 10th and 11th Italian soldiers vacating their barracks in groups had been seen in Rome, dressed in civilian clothes and some even in their underwear."

"At 2.20 pm on September 13 I left Rome by a train that, with the exception of one carriage, was full of unarmed Italian soldiers returning home. … The track was on the whole undamaged except in the following places: the Rome railway yards were bombed-out, likewise the Orte railway yard; in Bologna the railway yard was also bombed-out, likewise in Trento and Bolzano, where the bridge over the river was damaged. At least one track was undamaged in these places, too."

"In Northern Italy we met numerous German military trains travelling south. …"

Rahola also made a Finnish translation of a report by an Italian officer of the events taking place at the same time in the immediate vicinity of Rome. This suggests that the chaotic situation was caused by the fact that a secret truce between the Italian government and the Allies that was not intended to be announced until September 30 had already been leaked to the Germans via the American press on September 8. The supreme military command was thrown into confusion. Some of the officers made off with the King, hoping to get over to the British side, and even the General to whom the entire military command had been entrusted tried to join them, leaving all his subordinates in ignorance of what was going on. He was finally discovered calmly lunching with his son in civilian clothes. More and more officers went into civvies, fearing the Germans' revenge. According to the narrator, 50,000 well-armed men lost their positions, honour and arms in a mere three days. "If the word 'truce', which misleadingly sounded like 'we're going home' in the minds of all from the evening of the 8th onwards, had given us all the command 'victory or death', the honour of our armed forces and the interests of our fatherland would have been dealt the most grievous, possibly a fatal blow."

Seconded to the Naval Headquarters as an expert on quality wooden boats was boat designer and graduate engineer Jarl Lindblom. He had already had dealings with Jaakko Rahola back in the 1930s, and in the 1940s had studied the innovative technique of making boats by gluing in the United States. This was extremely useful for building Taisto-class boats at home in Finland. His royalties for this had to be paid to the Baglietto shipyard in Italy, even though the drawings had been considerably altered in Finland to improve the boats' characteristics and performance. Rahola and Lindblom were good friends and their families got on well; they even went on holiday abroad together once the war was over.

During the war, Jaakko Rahola was promoted to the rank of Commander.

PROFESSORSHIP

The establishment of a Chair in shipbuilding at the Helsinki University of Technology, and the appointment of its incumbent had been a long and complex process. A plan had already been afoot at what was then the Polytechnic in 1898 for raising it to university status and for making shipbuilding a separate department. Study in this department would take five years instead of the four in other departments. In a statement issued the following year, the then Board of Industry

nevertheless claimed that a whole department of its own would be too big for the needs of shipbuilders, as indeed it undoubtedly would have been. The establishment of a regular lectureship was, however, deemed necessary.

The raise to university status was, however, postponed and tuition in shipbuilding began along modest lines in 1905, on the appointment of an assistant teacher. When the Polytech was finally upgraded to the University of Technology in 1908, a supernumerary lecturer was placed in charge of the tuition. Until 1911, this post was held by Henrik Schwartzberg, an engineer. He is said to have been an efficient, active teacher. In 1911 he took up a job in industry and the University had difficulty covering his teaching commitments. After two years on leave of absence, he finally resigned.

The University gave Schwartzberg a glowing reference and spoke of the deep loss to the University. Schwartzberg was, it was felt, the only Finnish engineer at the time fully equipped to teach his subject and, it was hinted, competent for an even higher post. It did indeed prove impossible to find a successor of his calibre and the post remained partly unmanned and partly subjected to temporary arrangements for a decade or so.

Appointment

Once the Polytech had received University status in 1908, steps were taken to set up a Chair in shipbuilding, but the decision was not finally made until 1922. Applications were invited, but only one of the applicants, John G. Lake, was considered sufficiently qualified. One of the other applicants then appealed against the decision, the post was again declared open, and again three applications were received, though this time not from Lake. The applicants were given 18 months in which to gain the necessary qualifications, but still none met the requirements.

Meanwhile, the Professorship had been handled by one of those who had applied on each occasion – an engineer by the name of E.J. Helle. He had been acting lecturer for three years while Schwartzberg was on leave of absence, and in 1933 had obtained a Doctorate in Berlin. When the post was once again announced in 1937, Helle was one of the two applicants. The other was his pupil, Jaakko Rahola, then working on his doctoral dissertation. Both requested and were granted 18 months in which to qualify. Rahola did not, however, reveal much of what he felt in setting up in competition with his teacher, but he did say, in a speech he made on his 60th birthday, that he “just had to apply regardless”. He also let on that for many years Rector of the University had urged him to apply.

Rahola completed the manuscript for his dissertation in 1938 and received his Doctorate the following year. He was not, however, granted the right to call himself Doctor of Technology until December 1940. Both candidates for the Professorship were deemed qualified but preference was unanimously given to Rahola. The other candidate, Helle, appealed against the decision and the appointment was postponed. The appeal did not change the situation, however,

and on June 20, 1941 Jaakko Rahola was appointed Professor of Shipbuilding at the Helsinki University of Technology as of September 1, 1941. fig. 10

Figure 10 The Rector at university degree ceremony.

Perusal of the lengthy appointment process indicates that the University had clearly been dissatisfied with Helle, the temporary incumbent of the post, for quite some time, and even after he obtained his Doctorate in Berlin. This must have been a great tragedy for Helle, but the letter Rahola had sent his wife from Italy ten years before, mentioning the standard of the teaching in Helsinki, did indeed support the University's opinion.

Teaching on top of the war effort

When Jaakko Rahola began as Professor, the Continuation War of 1941–1944 had just begun. The previous winter, he had been appointed temporary head of the Naval Headquarters shipbuilding department and his work there continued throughout the war. Most of the students were, of course, away at the front, so the tuition was very much on the back burner. During the 1941–1942 academic year, no lectures were given; students could only report for exams, but from then until spring 1944 there were lectures and practicals again. Men fighting at the front could be granted six months' leave for study purposes and the University tried to arrange tuition to coincide with this. Three students attended Rahola's series of lectures; one of them, Jan-Erik Jansson, would in time be his successor.

Rahola had, as we have seen, been very dissatisfied with the standard of shipbuilding tuition at the University. On applying for the Professorship, he naturally wanted to bring about some improvement. But just when he wanted to set about reforming the study programme, his time was taken up by his wartime assignments and those in Italy. The weightiest topic in the lectures he gave during the war and the years thereafter, during which Finland was required to pay war indemnities to the Soviet Union, focused on the stability of ships – the topic of his doctoral dissertation. Little by little he worked on other subjects, too, as time permitted. A separate module specialising in shipbuilding was, however, introduced very soon after his appointment, the number of lessons in the subject was greatly increased and the subject was brought forward by one year to the second year.

Tuition under pressure from the war indemnities

In autumn 1944, Rahola was made responsible for directing the State Shipyard (Valmet), and soon after this for organising the ships to be delivered to the Soviet Union as war indemnities; the administration of this was entrusted to the War Indemnities Commission (Soteva). Because

of the demands made by the latter duties, he was made a member of the Board instead of the Director of the shipyard. At the same time, he was required to increase the university tuition, both qualitatively and quantitatively, to meet the industry's new requirements. The subjects vital to any shipbuilder – hydro- and aerodynamics, and welding – had been made compulsory, and after the war, separate specialists were taken on to teach ship-building techniques and marine engines. To teach the latter, Rahola called upon a young graduate engineer, Christian Landtman, who had written his Master's thesis on the subject. Landtman's lecture handout remained in use long after he had begun to concentrate on a highly-distinguished shipyard career.

Rahola had also been made head of the Mechanical Engineering Department at the University in summer 1944. This all greatly added to his workload in the oppressive and unstable climate of the postwar years. Some foreign shipbuilders have wondered why, having developed such a significant theory, Rahola published so little after his doctoral dissertation. It appears from certain documents that he had in fact intended to continue his research on the subject immediately after his dissertation, and that he did take it up again after the war. In 1950, he was even awarded a grant for this purpose. Considering the enormity of his workload during and immediately after the war, it is nevertheless understandable that he had no chance whatsoever of paying research his profound attention. He also continued as head of the Mechanical Engineering Department right up until 1955, when he was appointed Rector of the University.

A letter has been preserved from that very summer in which Rahola says he is struggling to prepare his first University budget while at the same time being obliged, as a member of the Board, to be responsible for and participate in drawing up and submitting Valmet tenders.

Jaakko Rahola's period as Rector of the University of Technology was made all the more onerous by the University's move from the city centre to the new campus in suburban Otaniemi. This involved a building project of vast proportions. Rahola was also a member of numerous national boards and committees.

The Continuation War ended in Moscow on September 19, 1944 with an interim peace treaty between Finland and the Allies. One of the terms of the treaty was that Finland had to supply the Soviet Union with goods to the value of 300 million gold dollars. When the agreement had already been signed, the Soviet Union suddenly announced that although the exchange rate of the dollar was, in the treaty, tied to the rate of exchange on the day the agreement was signed, the rate for 1938 would be applied in pricing the goods. During the war, inflation had halved the value of the dollar, so the value of the goods demanded as war indemnities was in fact twice that to which the peace negotiators had believed they were committing Finland. The Soviet Union refused to compromise, but nevertheless agreed to lesser increases of 10 and 15 per cent for certain categories of goods. In 1948, the Soviet Union further agreed to halve the value of the outstanding deliveries. This did not, however, affect the number of ships. The indemnities finally amounted to 226.5 million gold dollars at the exchange rate of 1938, which in turn corresponded to 444.7 million dollars at the current rates. The deliveries had to begin at once and be completed within six years. The following year the Soviet Union granted a time extension until September

19, 1952, because the raw-material and plant suppliers were universally inundated with orders in a world just recovering from the war.

Vessels of various kinds represented 35.4 per cent of the deliveries. Of these, 14.0 million dollars took the form of some of the newest ships belonging to the state and local authorities and private companies. New ships were built to the value of the remaining 66.2 million dollars.

Some of the vessels demanded were of types already built in Finland; others were quite new. The average annual output of the Finnish shipyards before the outbreak of war in 1939 was only one-twentieth of that needed to meet the terms of the peace treaty. Successful delivery of the war indemnities was a vital element of the peace treaty – failure to deliver would have had fatal consequences for Finland. Since ships represented more than a third of the total indemnities demanded, and the existing shipbuilding capacity covered only 5 per cent of the requirement, the situation looked hopeless. Old shipyards had to be expanded as quickly as possible and new ones built. But they also needed trained personnel at all levels. In the steel-ship sector, the personnel of the shipyards increased by 63 per cent and in the yards building wooden ships by as much as 670 per cent.

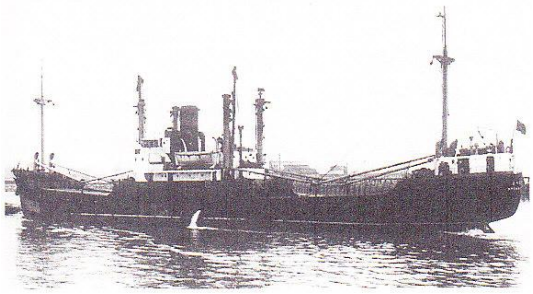

Figure 11 (top) A Hollming war-indemnity schooner on a trial run from Rauma to Helsinki in June 1947.

Figure 12 (bottom) More than a third of the war-indemnity deliveries consisted of vessels of various kinds. Some, such as the three-island type *Dnjestr* cargo ship seen here, were in accordance with ship series previously built in Finland. (Courtesy: Matti Pietikäinen)

Two jobs

In this menacing climate, Jaakko Rahola was obliged to shoulder the responsibility for two jobs. On the one hand he had to vastly increase the university training of shipbuilders and at the same time to raise the quality, while on the other he was ordered, as the government's representative, to direct the expansion and division of labour of the shipbuilding industry to meet the war-indemnity demands.

An industrial war-indemnities delegation with an office of its own known as Soteva had been set up in the state administration, i.e. the Ministry of Trade and Industry. In December 1944, Rahola

was appointed head of its shipbuilding department in addition to his regular post, vice-chairman of the expert board on shipbuilding and chairman of the ships committee. By February of the following year, his post had been changed to head of department and in autumn 1948 further to director of shipbuilding.

Even before Soteva was set up, Rahola had been planning ways of meeting the shipbuildin commitments. Jussi Nemes, director of the Vator Boatbuilding Company, recalled how the Professor had stopped him in the street in Helsinki in November 1944 and said he wished he would start building boats and small wooden craft as war indemnities. Nemes was indeed emboldened, with the help of his family, to rescue the shipyard silenced by the war and in this way to guarantee jobs for its workers. War indemnities were to be the start of a thriving line in boat production. When the indemnity schooners turned out to be much bigger than the peace negotiators had expected, Vator nevertheless stopped making them.

Panic broke out on December 17, 1944, when the Soviet Union presented a list of goods. The Finns' amazement was complete when they read that they were to hand over their best ships, fully serviced and in perfect condition, and what is more, that very month. The war had in any case almost halved the Finnish merchant fleet, and there had not been time to service what remained in the normal way. The following day, Jaakko Rahola was ordered to chair a six-member committee whose devastating and odious task was to inform the owners of the ships, to transport the vessels to agreed hand-over points and to appoint Finnish receiving committees to do the job.

The shipbuilders who had been students during the war-indemnity years unanimously reported the excessively busy life of their Professor as he shuttled between the University, the Soteva office and the shipyards.

THE UNIVERSITY YEARS

Jaakko Rahola had only ever handled his Professorship in a state of emergency when he was appointed head of the Mechanical Engineering Department in 1944. During the war, electrical and industrial engineering had been set aside, leaving mechanical engineering, shipbuilding, aircraft building and textiles. Mechanical engineering was further subdivided into production, structural and sanitary.

As a lecturer, Rahola was extremely businesslike. I myself was the only student attending the first double lecture in the spring semester of the Shipbuilding I course as the other two students had thought the course did not begin until the following week. The Professor calmly delivered his lecture, glancing at his notes, just as if he were addressing a full lecture hall. His businesslike manner did not, however, mean he was cold. His attitude was that of a gentleman and he looked after his students.

One of the jobs of a Professor is to supervise his students' practical work. A student was once up in the laboratory attic putting the finishing touches to his year-three assignment and showed the Professor his carefully-drawn design for a cargo ship. He had meticulously drawn the wooden cargo hatches and for the sake of clarity had left a few of them open. Rahola said a few kind words about the assignment before adding, "But it might be a good idea to close the hatches to make sure no one falls in." An acquaintance with good seafaring practice is useful for the shipbuilder, too.

A peek at a Rahola exam: In one of his orals, a student was asked a question about a stability method about which he had not a clue. An enterprising young man, the student nevertheless began to expound on a method off the top of his head. Having listened to the somewhat lengthy reply, the Professor came out with: "Well I've never heard of such a method, but since you so admirably invented it off the top of your head, I'll give you a 3–." (The maximum was 3.)

Rahola clearly enjoyed the respect of his Professor colleagues. A new three-year Rector's term was beginning in 1955 and the Teachers' Council had convened to decide whom to appoint. The Rector for many years was loath to resign, so the Council withdrew to discuss the matter. When the meeting was resumed, Rahola was elected – to his predecessor's great surprise. The work of the Council during Rahola's time as Rector has been described as both amicable and efficient.

The assistants of the Finnish universities once, *en masse*, had cause to thank Rector Rahola. The trade union for civil servants was planning its first ever strike. Many government officials were of the opinion that their oath of office did not allow them to strike, and many Professors agreed. The assistants were, however, going on strike and the Rector asked the University's strike leader, Ilmari Kurki-Suonio to come and see him. When asked by Rahola how the assistants had arrived at their decision, Kurki-Suonio replied that, like many others, he had taken up his post at the University for half what he was being paid in industry. "Where, before long, are you going to find assistants to engage in post-grad studies and become Professors?" The Rector got the point and went into action. The assistants at all the Finnish universities were granted a well-earned but unprecedented rise of five whole pay grades!

The students' friend

Though Jaakko Rahola appeared on the surface to be a man of few words, he had a warm relationship with all the students, and not just the shipbuilders. He was elected president of several student associations and was, of course, an honorary member of the Shipbuilders' Club. The Club even named its ice yacht *Jaakko*. Rahola would sometimes invite the Club's committee to his home, serve them refreshments and accompany them on the piano as they sang.

A music lover and a long-standing member of both the Polytech Orchestra and the Polytech Choir, Jaakko Rahola always tried to attend their concerts. At the Orchestra's concert ball, he might take his seat at the grand piano and join in the musical fun, playing from memory. In 1952, he was the manager of a long Choir concert tour to seven countries. The Choir travelled in a bare

transport plane fitted with temporary seats for 45 they had hired from England. Often among the listeners at their concerts were some of the highest government officials, who then held receptions at which Rahola would speak on the Choir's behalf. In Vienna, the Choir met Federal Chancellor Lidl and the highest representatives of the then occupying states. From Athens he wrote to his wife, comparing Finland, Greece and Israel:

"…though the much-praised Archipelago is not on a par with Finland's. The islands are too far apart. Seen from a ship, they might possibly be finer because of their height. …Athens itself looked a pleasant city, but I did not notice anything grand apart from the Acropolis and the other hills. The food is just like that on an Italian menu and thus good, but the wines are inferior to the others, the French and Italian.

"…The Choir has done well, if not excellently, in the artistic sense, and the reviews have without exception been glowing. In Israel, they particularly praised the Choir for carrying out pioneering work; as a demonstration of this I might add that one choir leader asked if he could have the music of almost all the songs so they could perform them.

"… Israel really is a land of contrasts. There are communist-like communities – though they are not communist in their ideals – in two of which the Choir performed, and on the same day you could see the most modern Tel Aviv, and Nazareth, just as it was in Jesu's day. In the latter, the women fetched water from Mary's well just as they did 2000 years ago, though with one exception, they did not have a clay pot; instead, they had a rusty tin can. They ride donkeys everywhere, the little lads squatting on the donkey's rump, the heavy old men making the little beast a hunchback. The young lads would flirt by racing their donkeys round and between the girls carrying water on their heads and frightening them. The incredibly filthy Arabs rattled their wares on both sides of the twisting arcade and the water and other slops were poured into a gutter, or to be more precise a broad trough running down the middle of the arcade. …

"Mountains and hills alternate with open fields and desert, affording different views: Tabor, Armageddon, Nein, Nazareth, the Sea of Galilee, Capernaum, Jerusalem, Bethlehem were all experiences …"

This, then, was a Finnish view 50 years ago.

The tour continued to Italy and the Vatican, where the Choir sang to Pope Pius XII, who was from time to time moved to beat time with his foot. Rahola spent half an hour talking to the Pope in Italian, and the Pope asked whether he might bless the Choir. Rahola was particular over matters of conscience and was not sure whether the proposal was fitting for a choir in which most of the members were Lutheran. Thus the Choir did not receive the Pope's blessing, but it did accept the papal medal.

Each student at the University would, if not before, meet the Rector in person on receiving his or her degree, for it was he who gave out the certificates. One architect recently recalled how the

Rector had, with a quizzical look, stared at the long time the graduate had taken to complete her degree. Then he had consoled either himself or the graduate with a few kind words about his good grades. In my case, the Rector simply sighed.

As a rule, Jaakko Rahola was careful with money, both his own and in his job. Even as Rector, he made no complaints about the very scant hospitality allowances. Sometimes, however, he found himself in a fix. Once, when his secretary phoned the chairman of the board of the student union, saying he wished to see him, the worried chairman wondered what the students had been up to this time. But he need not have worried: the Rector was expecting some foreign guests and there was no money left in the hospitality fund. He therefore cautiously enquired whether the student union might be able to help. The union saved the day by inviting the Rector and his guests for a sauna session on the Otaniemi campus, complete with sausages to roast in the traditional manner.

The Rector did, however, sometimes receive complaints about his flock. A Minister's son and his pals were once hauled up before the Rector in the presence of the victim of a prank. The Rector gave the lads a piece of his mind and they were very ashamed, but after the victim had gone, the Rector laughed and told them to make sure they were not caught next time.

Otaniemi

Jaakko Rahola's term as Rector was greatly burdened by the moving of the University of Technology from the centre of Helsinki to suburban Otaniemi in the neighbouring town of Espoo. For as Rector he found himself in charge of a vast building project that involved endless queries about funds, and participation in the planning and supervision of the project; one problem after another.

A great friend of the shipbuilding students, the colourful Professor of steam technology Per-lger Sahlberg, once appeared in their lecture hall saying he had just met the Rector looking very worried. The Rector had said the architect had designed the thermal power plant in such a way that the control room was in a very awkward place, and that it would be disturbed by the road running past it. "What do we do now?" the Rector had asked. Sahlberg said he replied that if the designer of a ship draws the navigation cabin over the hold, or if a passenger has to pass diagonally through the bridge in order to get to the mess, wouldn't you change the designer? Yes, well – easier said than done. Sahlberg had, from the plant's topping-out ceremony onwards, told a couple of his fellow Professors: "I won't say this is a fiasco, because the Rector has ordered me three times not to say so."

At times Rahola did, however, refuse to budge in negotiating with architects. When the light fittings designed by the celebrated Finnish architect Alvar Aalto differed little from standard products but cost far more, Rahola, true to character, insisted on saving the government's money. Indeed, his wife once exclaimed that if Jaakko had been given a penny for every hundred he saved the government, they would be rich.

A portrait was painted of Jaakko Rahola for his 60th birthday. At the unveiling, he gave a speech of thanks in which he looked back over his life and career. True to character, he refrained from boasting of his achievements. Instead, he picked out lucky breaks in the course of his career and confessed that the only mistakes he had made in life were not only those in the canoe he built as a lad.

He had arrived at the Polytech little by little, he said, through a series of minor posts. “It was like coming home. I’ve enjoyed it all tremendously. I’ve become a permanent fixture at the Polytech, a piece of furniture that is shoved around, and now a painting on the wall. Thank you for this, too.”

THE TECHNICAL RESEARCH CENTRE OF FINLAND (VTT)

Rahola also played an important part in paving the way for the establishment of an institution of significance to shipbuilding research and the testing of models, a need for which had long been expressed. To this end, he embarked on a long tour of Europe in 1950 and a second one to the United States in 1951. While in the USA, he attended both an international congress in ship modelling and the summer conference of the Society of Naval Architects and Marine Engineers. As Chairman of the building committee of the Ship and Hydraulic Laboratory, he was both efficient and punctilious. This laboratory was originally part of the University of Technology and engaged in widespread collaboration with industry that was of benefit to both parties. Later, when the University was transferred from the Ministry of Trade and Industry to the Ministry of Education, the execution of commercial commissions, i.e. serving both industry and the acute needs of merchant shipping, became more difficult. In order to rectify the situation, the laboratory was made part of the Technical Research Centre of Finland (VTT) organisation and commercial research could continue.

PERMANENT SECRETARY

The distinguished career of Jaakko Rahola centred on the University of Technology took a surprising turn in 1965 when he was invited to a take up a top post at the Ministry of Trade and Industry. He had had plenty of dealings with the Ministry while working both for Soteva and the University, but he was heart and soul a university man, a trainer of engineers and a promoter of technical sciences and had no wish to forsake this working environment at that stage of his life.

The reason for this surprising invitation was as follows. A separate Permanent-Secretary post had been established at the Ministry in 1965 and the President of the Republic was waiting for the Ministry to name a candidate. This nevertheless put the Minister in a quandary. Until then, the post had been handled by the head of the general department alongside his other duties. The man in question was very keen to be appointed the new Permanent Secretary, but he did not enjoy very widespread support and there were some other possible candidates. The Minister could not make up his mind and everything was on hold. The President tired of the shilly-

shallying and, in the absence of a clear nomination, appointed a candidate of his own. Offering the post to Rahola was, of course, an indication of the President's trust in him, and the President would not be pleased at having his offer turned down. Out of a sense of duty, and in order to minimise any bad feeling his refusal might cause, Rahola had to accept the President's nomination.

Technical education featured on an exceptionally wide scale during Rahola's term as Permanent Secretary. Otaniemi was still under construction, and universities were in the process of being established in two other Finnish towns, Tampere and Lappeenranta. The same applied to technical colleges and schools in various parts of Finland. Naturally Rahola was extremely competent to deal with such issues, and he was also highly familiar with all kinds of industrial questions. Director General Pekka Rekola, head of the Industries Department at the time, recalls how pleased they were when the long sought-after rise in funding for R&D was immediately forthcoming when Rahola began in office.

Rahola was not, of course, quite so at home in matters of trade and he probably never wished to actively intervene in the affairs of that department. Yet the Ministry seems to have been entrusted with a surprising number of issues touching on shipping. The names of the Maritime Administration and the Marine Research Institute cropped up frequently in the Ministry's correspondence, and so did ports and harbours. The old organisation had its own Maritime Department that had long been under the direction of a retired Rear Admiral by the name of Sundman. Maritime affairs, likewise the universities of technology and the Technical Research Centre of Finland (VTT) were now made subordinate to the General Department.

On the very eve of his retirement, the Permanent Secretary was further called upon in a case within his very own domain. In early 1969 there had been public debate about the sinking in January of that year of the cargo ship Bore IX. There had been a strong wind and a lot of ice had formed on the deck. The media were eager to point to a culprit, and people were asking the age-old question: captain, company, safety regulations or what?

The Finnish Ship's Officers' Union was concerned and on its initiative, the Maritime Administration proposed to the Ministry of Trade and Industry that a committee be appointed to investigate the need for Finland to draw up its own stability regulations. Rahola refused to chair the committee but agreed to act as scientific advisor. The committee very soon reported that Finland observed the international IMCO regulations drawn up expressly according to Rahola's Criterion and in a form approved by the Finnish delegates, so that no separate Finnish regulations were necessary. The outcome of all the investigations was that the Bore IX had not been wrongly designed or built and that she was fully seaworthy and correctly loaded when she set sail on her fatal journey.

Jaakko Rahola also held many positions of trust, some directly connected to his work and others touching on other interests: industrial and shipping companies, foundations, scientific bodies and government establishments.

RAHOLA THE MAN

One of Jaakko Rahola's hobbies was photography. In 1938, the Zeiss representative at the time gave him an Ikoflex mirror camera as part of his fee for designing a motor boat. The camera accompanied him wherever he went, on business or on holiday, until 1951, when he purchased an Exakta system camera for his stay in the United States, later adding telescope and wide-angle objectives and other accessories. There are in his family albums dozens of beautiful, extremely good photos of events in his private life and his close family, but also nature scenes and seascapes.

Like his wife, Jaakko Rahola was a great animal-lover. Many wounded birds, or chicks that had fallen out of their nests, were nursed by the family until they could fly again. In the late 1940s the Raholas kept chickens. Mrs Rahola's sister had a big hen house in her garden with ten hens and two cocks. Each day, the children would take them a bowl of porridge or other food and were given fresh eggs to take home. If a chicken fell ill, it was immediately taken inside to be nursed. When an egg appeared on its bed, the family would conclude that it was now recovered and could be returned to its mates.

For a time, the Raholas also had a pet rabbit and two baby goats, but they all had a sorry ending. Wiser for these experiences, they thereafter contented themselves with a boxer called Tomi that brought them great joy for 11 years.

Rahola the gourmet

One possibly surprising feature of Jaakko Rahola was his interest in cooking and cuisine. There is nothing very unusual about going into the kitchen to sniff the saucepans and anticipate the supper delights in store the moment one gets home, but Rahola also had a liking for many foreign dishes that did not really reach Finland until decades later. He had, after all, spent long periods in Italy as a young engineer and several times thereafter, and was therefore accustomed to Italian food. Osso bucco, pasta, risotto and other such fare frequently found its way onto the Rahola dining table. Even during the war, the family grew basil in pots, from seeds brought home from Italy. On his later visits to other countries Jaakko had a chance to widen his comparison of different cuisines. During the war and the shortages thereafter, the exotic tinned foods brought home from abroad were treats which the parents sometimes tried to relish in secret after the children had gone to bed, but the children guessed what was going on and would appear with such comments as, "Oh, locusts!". The time a friend brought some crabs back from Stockholm and invited the Raholas to dinner was a great occasion. In 1961, Rahola was invited to be a founding member of a Cheese Society, but because he was travelling at the time, he had to put off joining until later in the year.

One might be forgiven for imagining that Jaakko Rahola was a good cook, but according to his family, the only thing he knew how to cook was an egg, and sometimes not even that. The peas

he boiled while alone at home one day in the war were still not soft after two days' simmering. But he had precise rules for serving etiquette. Cold meats, for example, were not to be placed on top of a slice of bread; they had to be served on a plate and eaten with a knife and fork.

Music

Music was widely cultivated in Jaakko's family. His great-uncle Matti, dressed in a fine suit, was a church organist, and his cousin Oiva built violins. His relations on his mother's side were known for their music; among other things, his maternal grandfather built a harmonium and composed. All Jaakko's brothers and sisters engaged in musical pursuits. Sister Toini was a singer, brother Arvo published settings of his own lyrics, and another relative, Pirkko-Liisa Tikka, was an opera singer. And Jaakko lived in Arvo's home and was used to hearing music there.

Indeed, music remained close to Jaakko Rahola's heart throughout his life. He played the piano in his school orchestra ; while still a schoolboy he stood in for the organist (Mauno Suomi) at what is now Tampere Cathedral, and as an adult he acted as organist of Kulosaari Church in Helsinki. Arvo is known to have taken piano lessons from Mauno Suomi. Since Suomi asked Jaakko to cover for him, he must have been Jaakko's teacher as well. Arvo had a natural sense of harmony and Jaakko, too, was known for his skill at keyboard harmony. This must have contributed in part to his good ability to sight-read, which stood him in good stead in difficult chamber music.

As a student, Rahola was, as has been said before, one of the founders of the Polytech Orchestra; he also sang in the Polytech Choir and the Suomen Laulu choir. His ability to play the piano came in handy while he was doing his national service, when he would be asked to play at both conscript and regular staff events. This must have made a welcome change from the everyday military routine.

Jaakko played chamber music in a trio with Eero Saari, Managing Director of Airam, who as a young man had spent a year playing the violin in the Helsinki Philharmonic Orchestra, and cellist Kauko Kuoppamäki – all three of them founding members of the Polytech Orchestra. When their cellist emigrated to the United States, the other two played Baroque repertoire with flautist-Academician Erkki Laurila.

"Grandpa" would also encourage his grandson Atso Almila and delight in his development from a knee-high lad attending his piano lessons and writing pieces his own to a full-blown composer and Professor of Orchestral Conducting at Sibelius Academy.

Music meant so much to Jaakko Rahola's mother-in-law, Irene Lindgren, that on qualifying as a teacher, she bought a piano out of her very first pay cheque. Marianna Rahola had heard her mother playing and singing so much at home that she was so used to hearing live music that she resisted the purchase of a radio for long time, fearing that it would put an end to family music-

making. When Father was finally given a radio as a 50th birthday present, he often listened to orchestral concerts, sometimes following them with a score. On his retirement, Jaakko Rahola got rid of his piano, fearing that playing it in his small flat would disturb his neighbours; his hearing had also deteriorated.

FINAL WORDS

When Jaakko Rahola reached the age of 70, having by that time retired, the Marine Division of Wärtsilä Oy wanted to show its appreciation of his lifelong work by giving a dinner for him at the Savoy Restaurant. Rahola was told to invite whomsoever he wished. There were nine guests on his list, all Professors, captains of industry or high-ranking naval officers. One of the 11 hosts presented him with a set of unique Nuutajärvi glasses designed by Heikki Orvola and engraved with matt images of the 16 ship types built by Wärtsilä between 1956 and 1972 and Jaakko Rahola's initials. They were a Komsomolets liner, an Axel Johnson container ship, a Pacific car and timber ship, a Neptune-Orient Line semi-container ship, a Mont Royal ro-ro ship, a Hans Gutzeit general cargo ship, a Tsna cable ship, the Bore I car ferry, a 36000 BHP arctic ice-breaker, a 22000 BHP Moskva arctic ice breaker, a 22000 BHP Baltic ice-breaker, a Tarmo Baltic ice-breaker, the Song of Norway cruiser, the Royal Viking Star cruiser, the Finlandia car ferry and a Turunmaa fast gunboat. Together they represented 61 ships built.

Jaakko Rahola distinguished himself in two ways at home in Finland. On the one hand he raised the teaching of and research into shipbuilding to a completely new plane at a time when it was of the utmost importance to Finland as a nation, and on the other he strongly influenced the very highest technical education and the development of technology in general.

His stability criterion made him internationally renowned. Although it has not been able to prevent all disasters at sea, it has, in the space of 70 years, saved many lives and much property.

As a man, Jaakko Rahola was modest and self-effacing. He was very careful not to commit himself to anything that might have conflicted with his obligations and oath as a civil servant – in the economic, political, or any other sense. Despite countless invitations, he never joined any fraternity and further warned his sons that the oath of solidarity required of membership may sometimes turn against one in an unexpected manner.

Politically, Rahola did not sympathise with the Germans and he never read any of the bulletins sent home by German officers during the war. He would not allow them even to be left on his desk; the family had to throw them away. Just before the war, he sold his damage stability invention to Britain (which, as one of the Allies, was later officially at war with Finland), not Finland's ally, Germany. He avoided controversial issues in domestic politics. If anyone criticised politicians over dinner, he would try to placate them by saying, "But dozens of wise people have come to the same conclusion."

Jaakko Rahola is remembered as a humane and widely-educated person. He was one of the captains of technology and industry who emphasise technology as man's servant and man as the implementer of technology. He ended his *Studia generalia* lecture in 1952 with the following words:

"We technologists must not close our eyes to the fact that the exact, applied and technical sciences have a considerable lead over the humanities. The world of matter and machines has attracted all the attention and the spiritual world has fallen aside. This is a glaring weakness, a misfortune, even. But we cannot combat it by putting the brake on technical development. Our only option is to make our knowledge of man's mental and physical in harmony with the progress being made in the material sciences and technology. Only in this way can we create a better world.

"Our technological women and men have an important part to play in this our striving. We are especially susceptible to over-materialisation. It is our daily job in industry to create things that are new and technically better than ever, to create them inexpensively, and in large quantities. In doing so, we easily forget that the most important machines in the production process are our human beings. It is up to us to include them, too, their mental and physical world."

Figure 13 Portrait of Jaakko Rahola, a photograph taken at his summer cottage